Semester: I/II						
ENGINEERING PHYSICS (Theory and Practice)						
Course Code	**:**	21PH12/22		**CIE**	**:**	**150 Marks**
Credits: L: T:P	**:**	3:0:1		**SEE**	**:**	**150 Marks**
Total Hours	**:**	45L + 30P		**SEE Duration**	**:**	**3 Hours**

Unit-I	**9 Hrs**
Elasticity and Oscillations: **Elasticity:** Hooke's law (qualitative), bending of beams, single cantilever (derivation), torsion of a cylinder: torsion pendulum, Numerical problems. **Oscillations:** Damped and forced harmonic oscillations: differential equation for damped and forced oscillations, LCR circuit (qualitative), electrical resonance, Numerical problems.	
Unit – II	**9 Hrs**
Quantum mechanics Blackbody radiation, Matter waves, Group velocity and phase velocity, Heisenberg's Uncertainty principle and its application, Broadening of spectral lines, One dimensional time independent Schrodinger's wave equation (TISE), Properties of wave function, Eigen functions and Eigen values, application of TISE: One dimensional infinite potential well and free particle. Numerical problems.	
Unit –III	**9 Hrs**
Electrical Conductivity in solids: Postulates of Classical free electron theory (CFET) and Quantum free electron theory (QFET), Density of states in three dimensions (qualitative) and Fermi factor. Fermi energy: variation of Fermi factor with temperature. Band theory of solids (qualitative approach), electron concentration in metals at 0K. Intrinsic semiconductors: electronic concentration in conduction band and hole concentration (qualitative), Fermi level in intrinsic semiconductors, Extrinsic semiconductors: Variation of carrier concentration with temperature and Fermi energy with doping, Hall effect for metals and semiconductors, Numerical problems. **Dielectrics:** Types of Polarizations**.** Qualitative treatment of Internal field in solids for one dimensional infinite array of dipoles (Lorentz field). Clausius-Mossotti equation(derivation). Numerical problems.	
Unit –IV	**9 Hrs**
Lasers and Optical fibers: **Lasers:** Interaction of radiation with matter, Energy density in terms of Einstein's coefficients, Laser requisites, CO_2 laser, Application of laser, Laser in eye and skin surgery, Numerical problems. **Optical Fibres:** Numerical aperture of an optical fibre, types of optical fibres, V-number, attenuation in optical fibres, types of attenuation, Point to Point communication, applications in sensors, phase modulators, Numerical problems.	
Unit –V	**9 Hrs**
Electron Ballistics & Surface Characterization Techniques Motion of charged particle in transverse $\vec{E}$ & $\vec{B}$ fields: $\vec{E}$ perpendicular to velocity, electrostatic deflection (qualitative), electron projected at an angle (qualitative), Magnetic field acting at an angle to initial velocity, Lorentz force equation, Application of crossed $\vec{E}$ & $\vec{B}$ configuration as a velocity selector, Electron & Magnetic lens, Applications in Scanning Electron Microscope, Scanning Tunnelling Electron Microscope. Numerical problems.	

Sl. No.	Lab Experiments
1	Determination of Young's modulus of the given material.
2	Determination of rigidity modulus of the given material.
3	Determination of spring constant, effective spring constants using springs in series and parallel.
4	Determination of wavelength of the given laser.
5	Determination of hall coefficient and carrier concentration of a given semiconductor.
6	Determination of the band gap of a given thermistor.
7	Determination of dielectric constant of a material using charging and discharging of the given capacitor.
8	Determination of numerical aperture, acceptance angle and fiber loss of a given optical fiber.
9	Fermi energy of a material.
10	Verification of Stefan's Law.

Course Outcomes: After completing the course, the students will be able to:-	
CO1	Understand the basic principles of oscillator, elastic properties of materials, quantum mechanics, electrical properties of metals & semiconductors, dielectric properties of materials and behavior of charged particles in electric and magnetic fields.
CO2	Apply the Physics principles to solve Engineering problems in elasticity, oscillation, applied optics, and semiconductors.
CO3	Analyze and solve complex problems using critical thinking.
CO4	Design and develop models by simulation using open-source tools and validate with real time experimentation.

Reference Books	
1	Engineering Physics, Hitendra K Malik and A K Singh, 2010, Tata McGraw Hill Publication, ISBN: 9780070671539.
2	Engineering Physics, R K Gaur and S L Gupta, 2011, DhanpatRai Publications, ISBN: 9788189928223.
3	A Textbook of Engineering Physics, M. N. Avadhanulu and P G Kshirsagar, 2019, S. Chand publications, ISBN : 978-93-528-3399-3.
4	Physics for Degree students, C.L. Arora and Dr. P. S. Hemne, revised 2010, S Chand, ISBN: 9788121933506.
5	Fundamentals of Physics- Resnick, Halliday and Walker, 9th Edition, 2011, John Wiley & Sons, ISBN: 9780470547915.
6	Introduction to Electrodynamics, David J. Griffiths, 4th Edition, 2012, Pearson publishers, ISBN.978-93-325-5044-5.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**40**	
Case Study-based Teaching-Learning	**10**	
Sector wise study & consolidation (Topics from the current trends in Science & Technology and augmenting the syllabus)	**20**	
Video based seminar (4-5 minutes per student)	**10**	
MAXIMUM MARKS FOR THE THRORY	**100 MARKS**	**100 MARKS**
PRACTICALS **CIE**: Conduction: 25 Lab test: 05 Experiential Learning: 20 Total : 50 **SEE**:	**50**	**50**
TOTAL MARKS FOR THE COURSE	**150**	**150**

CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**1**	**---**	**--**		**2**	**--**	**--**	**--**	**--**	**--**	**3**
CO2	**3**	**2**	**---**		**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
CO3	**3**	**3**	**2**	**2**	**2**	**--**	**--**	**--**	**2**	**--**	**--**	**--**
CO4	**3**	**3**	**3**	**2**	**3**	**2**	**2**	**--**	**2**	**3**	**3**	**--**

High-3: Medium-2 : Low-1